Survey of Sediment Quality in Puget Sound, 1997-1999—Chemical Contamination

Maggie Dutch, Sandra Aasen, Chrissy Ricci, Kathy Welch *and* ***Ed Long***
Washington State Department of Ecology

Extended Abstract

Surficial sediments from 300 locations throughout Puget Sound were collected during June of 1997, 1998, and 1999, and tested to determine the extent of chemical contamination for over 160 metal and organic compounds. This work was conducted as part of a three-year cooperative agreement between the Sediment Monitoring Component of the Puget Sound Ambient Monitoring Program (conducted by the Washington State Department of Ecology) and the National Oceanic and Atmospheric Administration's National Status and Trends Program. Spatial patterns and gradients of chemical contamination, along with estimates of the spatial extent of chemical contamination throughout the study area, are displayed. The majority of compounds for which chemical analyses were performed in the 300 sediment samples were measured at levels below state criteria and national guidelines. One hundred forty eight (148) stations had no compounds exceeding Washington State Marine Sediment Quality Standards (SQS) or Puget Sound Marine Sediment Cleanup Screening Levels (CSL) (Washington State Sediment Management Standards–Ch. 173-204 WAC). One hundred twenty three (123) stations had 1-2 compounds exceeding SQS or CSL values, due primarily to the high levels of 4-methylphenol, phenol, and benzoic acid at these stations. The number of stations with 3-9 compounds exceeding SQS or CSL values decreased from north (12) to central (9) to south (3) Puget Sound, and occurred primarily at stations located in Everett Harbor, Elliott Bay, and the Commencement Bay waterways. The number of stations with >10 compounds exceeding SQS values was minimal, and occurred only in one station from Elliott Bay and one station in Middle Waterway (Commencement Bay). Mean Effects-Range Median (ERM) quotient values (Long and MacDonald, 1998) were generally higher in urbanized embayments, and exceeded 1.0 at stations located in the Duwamish Waterway, Elliott Bay shoreline, and the Thea Foss and Hylebos Waterways (Commencement Bay). The total numbers of samples exceeding ERM, SQS, and CSL guidelines for the entire Puget Sound study area were 41, 134, and 106, respectively, while the estimated spatial extent of chemical contamination (expressed as percentage of total area) relative to ERM, SQS, and CSL guidelines was 1.3%, 34.0%, and 28.6%, respectively. Detailed results from each year of the study are published in Long et al., 1999, 2000, and in prep. A report summarizing all three years of data, with multivariate analysis to further determine relationships between the triad parameters, will also be prepared.

References

Long, E., J. Hameedi, A. Robertson, M. Dutch, S. Aasen, C. Ricci, K. Welch, W. Kammin, R.S. Carr, T. Johnson, J. Biedenbach, K.J. Scott, C. Mueller, and J. Anderson, 1999. Sediment Quality in Puget Sound, Year 1 - Northern Puget Sound. Washington State Department of Ecology, Olympia, WA, Publication No. 99-347 and National Oceanic and Atmospheric Administration, Silver Spring, Maryland, NOS NCCOS CCMA Technical Memo No. 139, 221 pages.

Long, E., J. Hameedi, A. Robertson, M. Dutch, S. Aasen, K. Welch, S. Magoon, R.S. Carr, T. Johnson, J. Biedenbach, K.J. Scott, C. Mueller, and J. Anderson, 2000. Sediment Quality in Puget Sound, Year 2 - Central Puget Sound. Washington State Department of Ecology, Olympia, WA, Publication No. 00-03-055 and National Oceanic and Atmospheric Administration, Silver Spring, Maryland, NOS NCCOS CCMA Technical Memo No. 147, 198 pages.

Long, E., J. Hameedi, A. Robertson, M. Dutch, S. Aasen, K. Welch, S. Magoon, R.S. Carr, T. Johnson, J. Biedenbach, K.J. Scott, C. Mueller, and J. Anderson, in preparation. Sediment Quality in Puget Sound, Year 3 - Southern Puget Sound. Washington State Department of Ecology, Olympia, WA, and National Oceanic and Atmospheric Administration, Silver Spring, Maryland.

Long, E. and D. MacDonald, 1998. Recommended uses of empirically-derived, sediment quality guidelines for marine and estuarine ecosystems. Journal of Human and Ecological Risk Assessment 4(5): 1019-1039.